

Memorandum



To:	File	Date: 8/31/00
From:	HDR	File #: 7.5.9, 7.5.10
Subject:	Project Area Water Bodies and Wildlife	

INTRODUCTION

The project area for the Gravina Access Project encompasses the nearshore areas of Revillagigedo and Gravina islands and Tongass Narrows in the vicinity of Ketchikan, Alaska. In addition to Tongass Narrows, the most significant water bodies located in the project area are: Lewis Reef Creek, Government Creek, and Clam Cove on Gravina Island, and Hoadley Creek, Ketchikan Creek, Carlanna Creek, and Ward Cove and Creek on Revillagigedo Island. The U.S Geological Survey, U.S. Fish and Wildlife Service, U.S. Forest Service, Alaska Department of Fish and Game, Alaska Department of Environmental Conservation, and the National Marine Fisheries Service were contacted to obtain existing water quality and flow data on the water bodies within the study area. The amount of available information for water bodies in the Ketchikan area is limited. This memorandum summarizes the characteristics of these water bodies and the wildlife they support, based on available information.

SURFACE WATER

Tongass Narrows

Tongass Narrows is part of the Inside Passage of Southeast Alaska. It is a relatively narrow channel running between Gravina Island and Revillagigedo Island. Much of Tongass Narrows is included in the Gravina Access Project area. The southeastern end of the narrows splits into the East Channel and West Channel around Pennock Island. At the south end of Pennock Island, the narrows meets the northern end of Nichols Passage. The northwestern end of the narrows opens into Clarence Strait.

Tongass Narrows is characterized by strong tidal currents and by steep bedrock or coarse gravel/cobble/boulder shorelines. The waterway experiences strong tidal currents (Table 1).

Memorandum



Table 1
Tide information for Tongass Narrows

Extreme High Water (EHW)	+6.1 m (+20.0 ft)
Mean Higher High Water (MHHW)	+4.7 m (+15.4 ft)
Mean High Water (MHW)	+4.4 m (+14.5 ft)
Mean Tide Level	+2.4 m (+8.0 ft)
Mean Lower Low Water (MLLW)	0.0 m (0.0 ft)
Extreme Low Water (ELW)	-1.5 m (-5.0 ft)

Source: National Oceanic and Atmospheric Administration (NOAA), July 1978.

In undeveloped areas, mainly on Gravina and Pennock Islands, Tongass Narrows is primarily steep bedrock or coarse gravel/cobble/boulder. Much of the lower intertidal and shallow subtidal areas are sandy or mixed gravel, sand and shell, with varied amounts of silt. Rocky points, mainly along the northwest shore of Pennock Island, have steep bedrock slopes extending to subtidal depths. Several small natural coves and areas protected by constructed breakwaters provide wave and current protection for anchorages and marine habitats. These locations, which include Ward Cove, have sandy or gravel bottoms.

Subtidal margins of Tongass Narrows are characterized by steeply sloping bedrock or coarse gravel/cobble bottoms extending from the lower intertidal zone to the deeper flatter center of the channel at depths of -24.4 to -45.7 m (-80 to -150 ft) MLLW. For the most part, these subtidal slopes are swept by strong tidal currents and support a number of kelp and other algal species down to depths of about -12.2 m (-40. ft) MLLW. In spring and summer, many of these rocky areas support a canopy of bull kelp. At depths below -12.2 m (-40 ft) MLLW, the bottom becomes nearly barren sand and gravel. The most abundant subtidal organism observed in the project area in the winter is sea cucumber (*Parastichopus californicus*).

Shallow subtidal areas that are protected from direct impact of the currents in small coves or behind breakwaters have gradually sloping sandy bottoms that often support healthy eelgrass beds. Eelgrass beds are found along in shallow waters along Revillagigedo Island north of Refuge Cove, near the floatplane dock south of the mouth of Ward Cove, north of the Amerigas dock, north of the Bar Point Marina breakwater, and south of the entrance to the Thomas Basin Marina. Eelgrass beds are found in shallow waters adjacent Gravina Island between the small cove north of the runway and the floatplane dock, and just south of the sunken tugboat in Tongass Narrows West Channel.

Memorandum



Project Area Watersheds

Project area watersheds were mapped in GIS and the watershed boundaries delineated. GIS was used to calculate watershed size (area). The following paragraphs characterize the watersheds based on size and the major water bodies contained within each watershed. A map of the watersheds and the table indicating the areal extent of each watershed are provided as an attachment.

Revilla Island Watersheds

Ward Cove Creek watershed is approximately 20 square kilometers (km²) (4,951 acres) in size. The watershed, which includes Ward Lake, Ward Cove Creek, Signal Creek and eight other tributary streams, flows to Ward Cove's northern shoreline (Tongass Narrows). From Ward Lake, Ward Cove Creek is 0.8 km [0.5 miles (mi)] in length before reaching Ward Cove. Tributaries for Ward Lake start as far as 4.8 km (3.0mi) north of the lake. To the south, Signal Creek is 2.3 km (1.4mi) in length before deposition of its waters into Ward Lake.

Carlanna Creek watershed is approximately 6.4 km² (1,589 acres) in size. The watershed, which includes Carlanna Lake and Carlanna Creek, is located along the western edge of Ketchikan's city limits. From its headwaters at Carlanna Lake, Carlanna Creek is 1.4 km (0.9mi) in length before reaching the Tongass Narrows. Another major tributary (other than Carlanna Lake) that adds to the Carlanna Creek flow, it is located to the west, this tributary is 2.1 km (1.3mi) in length before its confluence with Carlanna Creek.

Hoadley Creek watershed is approximately 5 km² (1,242 acres) in size. The watershed, which includes Hoadley Creek and its tributaries, is located within the western half of Ketchikan's city limits. Hoadley Creek is 2.7 km (1.7mi) in length before reaching the Tongass Narrows.

Ketchikan Creek watershed is approximately 47 km² (11,575 acres) in size. The watershed includes Ketchikan Creek and its tributaries, Upper and Lower Ketchikan lakes, Fawn Lake, Scout Lake and the Granite Basin Area. This large area deposits its waters into the Tongass Narrows through Ketchikan Creek, which outputs near the eastern side of Ketchikan's city limits. Ketchikan Creek, from its headwaters stretches approximately 10.5 km (6.5mi) before reaching the Narrows [3.4 km (2.1mi) from the southern end of Lower Ketchikan Lake]. A major tributary to Ketchikan Creek, the Granite Basin Area, collects water for approximately 5.8 km (3.6mi) before the Basins water confluence's with Ketchikan Creek and flows an additional 3.4 km (2.1mi) to the Tongass Narrows.

Memorandum



Gravina Island Watersheds

Lewis Point Creek Watershed is approximately 7.4 km² (1,838 acres) in size. The watershed, which includes Lewis Point Creek and its tributaries, deposits its waters into Tongass Narrows. Lewis Point Creek is 3.1 km (1.9mi) in length before reaching the Narrows.

Government Creek Watershed is approximately 7.6 km² (1,868 acres) in size. The watershed includes Government Creek and its tributaries; the area is also characterized by a large number of unnamed lakes. Very little topographic relief exists in this watershed, which deposits waters into the Tongass Narrows on the northern border of Gravina Island. Government Creek is 4.0 km (2.5mi) in length before reaching the Narrows.

Clam Cove Watershed is approximately 14 km² (3,533 acres) in size. This watershed is characterized by very little topographic relief, which accounts for the large number of lakes throughout its area without a major source of water transportation (i.e., stream, river). This watershed is located in the northeastern-most part of Gravina Island, paralleling the Tongass Narrows.

Hydrologic Characteristics of Project Area Streams

Information on flow characteristics of the streams within the project area is limited. The U.S. Forest Service, in its the Water Resources Atlas (April 1979), reported on water flow characteristics at Ketchikan Lakes and Carlanna Lake, which are upstream from where the project area, crosses Ketchikan and Carlanna creeks. Based on an annual average, monthly flow in the Ketchikan Lakes area [drainage area: 20 km² (8.1 square miles)] is approximately 245,500 liters per minute (lpm) [54,000 gallons per minute (gpm)], with highs in June and October [averages of 341,000 lpm (75,000 gpm) and 409,000 lpm (90,000 gpm), respectively] and lows in March [77,300 lpm (17,000 gpm), on average]. For Carlanna Lake [drainage area: 4 km² (1.5 square miles)], the average monthly flow is approximately 34,100 lpm (7,500 gpm) with highs in June and October [averages of 59,100 lpm (13,000 gpm) and 54,600 lpm (12,000 gpm), respectively], and lows in March [12,300 lpm (2,700 gpm), on average]. There is no other flow data available for streams in the area.

100-year Floodplain

The Federal Emergency Management Agency (FEMA) has mapped the expected 100-year floodplain for a small portion of the Ketchikan Gateway Borough (i.e., primary population areas). The limits of the FEMA study extend from one-half mile north of Carlanna Creek to the Coast Guard Station within the City of

Memorandum



Ketchikan. Much of the City of Ketchikan, including the Schoenbar, Hoadley, and Carlanna Creek areas lie within the floodplain of a 100-year flood (FEMA 1990).

Water Quality

The Alaska Department of Environmental Conservation (DEC), Division of Air and Water Quality regulate water quality in the State of Alaska. In 1994, the DEC placed Ward Cove on the water quality-impaired water bodies list [as per Section 303(d) of the Clean Water Act, which requires states to report on waters that carry pollutants in excess of the state's water quality standards] for exceedances of the standards for sediment, dissolved oxygen (DO), color, and toxic substances. The DEC removed color from the listing in 1997. The DEC completed assessments on Ward Cove and will begin preparation of a water body recovery plan in 2000. Recent studies in Ward Cove showed that bottom sediments and accumulations of decomposing wood debris generate hazardous substances that are toxic to benthic organisms, and contribute to seasonal depressions in DO. August 1998 water sampling completed in Ward Cove showed severe depressions in DO. At one sampling location, the layer of water that was below Alaska water quality criteria for DO was up to 30 m (98 ft) deep (DEC 1998).

There is no other water quality data available for other streams in the project area.

Factors that could contribute to water quality degradation in the study area include discharge from seafood processing plants, logging and associated timber industry facilities, and discharge from cruise ships. All of these activities have the potential to affect marine water quality. Logging activities also could affect freshwater water bodies.

Five seafood processors (Ward Cove Packing, Alaska General Seafoods, Trident Seafoods, E.C. Phillips, and Norquest) have fish waste outfalls discharge into deeper waters in Tongass Narrows adjacent to their facilities. Processors discharge under a National Pollution Discharge Elimination System (NPDES) general permit for Alaskan shore based seafood processors regulated by the US Environmental Protection Agency (EPA). Under permit requirements, the discharge outfalls are situated in continually flushed underwater areas. The processors must perform dive surveys at the outfall area approximately each year depending on the amount of discharge (Caroll 2000).

Logging activities are potentially harmful to surface water resources as a result of vegetation clearing, which could increase the likelihood of sediment transport to nearby streams. Log transfer facilities and timber processing plants on the shoreline can affect water quality by introducing naturally occurring chemicals to areas that would not be exposed to the chemicals under natural circumstances (e.g., Ward Cove).

Memorandum



Cruise ship discharges could potentially affect water quality throughout Southeast Alaska's marine waters. According to 40 CFR 122.3 (a), discharges of (treated) sewage, effluent from properly functioning marine engines, laundry, shower, and galley sink wastes ("greywater"), or any other discharges "incidental to the normal operation of a vessel," are exempt from the requirement to obtain a NPDES permit. Cruise ships may discharge at any location. Currently, the DEC is leading discussions concerning waste management and disposal practices of cruise ships while in state waters with the cruise ship industry and the state and federal agencies. The discussions will result in a determination of discharge rates, types, and areas within Southeast Alaska. Additionally, DEC will attempt to work with the industry on volunteer mitigation of suspected problems or, if necessary, enforceable regulations (Rodgers 2000).

FISH AND WILDLIFE

Freshwater rivers, streams, and lakes support a variety of fish and wildlife. Migratory birds and mammals use these waterways for food and many rear their young along these water bodies. Anadromous and resident fish also use these waterways for spawning and migration. Table 2 lists the animal species found in the Gravina Access Project area. The following paragraphs provide descriptions of the species commonly found in the study area, and their relationship to the water bodies in the study area.

Marine Mammals

Approximately eight species of marine mammals are found in the Gravina Access Project area. Harbor seals (*Phoca vitulina richardsi*) and Steller sea lions (*Eumetopias jubata*) inhabit Tongass Narrows year round. Additionally, humpback whale (*Megaptera novaeangliae*), killer whale (*Orcinus orca*), dall porpoise (*Phocoenoides dalli*), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), minke whale (*Balaenoptera acutorostrata*), and harbor porpoise (*Phocoena phoecena*) travel through the area (Frietag 2000 and KGB 1994;). Grey whales are sometimes observed in the area-off Vallenar Point and one California elephant seal was seen in Behm Canal.

Fish

Southeast Alaska has many freshwater lakes, rivers, and streams along with thousands of miles of shoreline. Together the fresh and marine waters support approximately 300 species of fish in about 65 families. This section identifies and describes some of the important anadromous and marine fish found in the Gravina Access Project area.

Memorandum

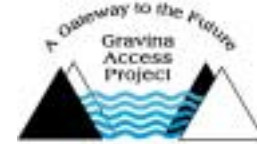


Table 2
Animal Species Found Within the Gravina Access Project Area

Terrestrial Mammals	Birds
<ul style="list-style-type: none"> Alexander Archipelago (gray) wolf (<i>Canis lupus</i>) Beaver (<i>Castor canadensis</i>) Black bear (<i>Ursus americanus</i>) Deer mouse (<i>Peromyscus maniculatus</i>) Dusky shrew (<i>Sorex obscurus</i>) Land or river otter (<i>Lutra canadensis</i>) Little brown myotis (bat) (<i>Myotis lucifugus</i>) Long legged myotis (bat) (<i>Myotis longicaudus</i>) Meadow vole (<i>Microtus pennsylvanicus</i>) Mink (<i>Mustela vison</i>) Northern flying squirrel (<i>Glaucomys sabrinus</i>) Pine marten (<i>Martes americana</i>) Red squirrel (<i>Tamiasciurus hudsonicus</i>) Red-backed vole (<i>Clethrionomys rutilus</i>) Sitka black-tailed deer (<i>Odocoileus hemionus sitkensis</i>) 	<ul style="list-style-type: none"> Pacific loon (<i>Gavia pacifica</i>) Mew gull (<i>Larus canus</i>) Herring gull (<i>Larus thayeri</i>) Glaucous-wing gull (<i>Larus glaucescens</i>) Common murre (<i>Uria aalge</i>) Marbled murrelet (<i>Brachyramphus marmoratus</i>) Pelagic cormorant (<i>Phalacrocorax pelagicus</i>) Canada goose (<i>Branta canadensis</i>) Mallard (<i>Anas platyrhynchos</i>) Oldsquaw (<i>Clangula hyemalis</i>) Surf scoter (<i>Melanitta perspicillata</i>) White-winged scoter (<i>Melanitta fusca</i>) Barrow's goldeneye (<i>Bucephala islandica</i>) Western grebe (<i>Aechmophorus occidentalis</i>) Bufflehead (<i>Bucephala albeola</i>) Common merganser (<i>Mergus merganser</i>) Common tern (<i>Sterna hirundo</i>) Bonaparte's gull (<i>Larus philadelphia</i>) Northwestern crow (<i>Corvus caurinus</i>) Common raven (<i>Corvus corax</i>) Varied thrush (<i>Ixoreus naevius</i>) Dark-eyed junco (<i>Junco hyemalis</i>) Red crossbill (<i>Loxia curvirostra</i>) Rock dove (<i>Columba livia</i>) Steller's jay (<i>Cyanocitta stelleri</i>) Chestnut-backed chickadee (<i>Parus rufescens</i>) Bald eagle (<i>Haliaeetus leucocephalus</i>) Black turnstone (<i>Arenaria melanocephala</i>)
Marine Mammals	
<ul style="list-style-type: none"> Dall porpoise (<i>Phocoenoides dalli</i>) Harbor porpoise (<i>Phocoena phocaena</i>) Harbor seal (<i>Phoca vitulina richardsi</i>) Humpback whale (<i>Megaptera novaeangliae</i>) Killer whale (<i>Orcinus orca</i>) Minke whale (<i>Balaenoptera acutorostrata</i>) Pacific white-sided dolphin (<i>Lagenorhynchus obliquidens</i>) Steller's sea lion (<i>Eumetopias jubata</i>) 	
Fish Species	
<ul style="list-style-type: none"> Chinook salmon (<i>Oncorhynchus tshawytscha</i>) Chum salmon (<i>Oncorhynchus keta</i>) Coho salmon (<i>Oncorhynchus kisutch</i>) Cutthroat trout (<i>Salmo clarki</i>) Dolly Varden char (<i>Salvelinus malma</i>) Pink salmon (<i>Oncorhynchus gorbuscha</i>) Pacific halibut (<i>Hippoglossus stenolepis</i>) Pacific herring (<i>Clupea pallasii</i>) Sockeye or red salmon (<i>Oncorhynchus nerka</i>) Steelhead/rainbow trout (<i>Oncorhynchus mykiss</i>) Lingcod (<i>Ophiodon elongatus</i>) 	

Adapted from: Ketchikan Gateway Borough Planning Dept. 1994; Heini and Goucher 2000; Heini 2000

Memorandum



Anadromous fish

Fish that spend periods of their lives in fresh and salt water, or anadromous fish, flourish in Southeast Alaska. All species of salmon, cutthroat and steelhead trout, and Dolly Varden inhabit project area and provide food for bears, wolves, bald eagles, and other animals. In the project area, anadromous fish are also valuable to commercial, resident, and visiting sport fishers. Lewis Reef Creek, Government Creek, Clam Clove, Hoadley Creek, Ketchikan Creek, Carlanna Creek, and Ward Creek are anadromous streams.

Pink salmon spawn in many of the creeks in Tongass Narrows. Adult pink salmon enter spawning streams in the area between late June and mid-October. Most pink salmon spawn within a few miles of the coast or within the intertidal zone of the mouth of streams and die soon afterward. In late winter or spring, the fry swim up out of the gravel and migrate downstream into salt water. Juvenile pink salmon then move along the beaches in dense schools near the surface, feeding on plankton, larval fishes, and occasionally insects (ADF&G 1999e). In the vicinity of Ketchikan, the Alaska Department of Fish and Game (ADF&G) has counted pink salmon in some area streams on selected days. These counts show the magnitude of the pink salmon populations in the Tongass Narrows. ADF&G recorded 6,550 pinks in Ward Creek in August 1998, 180,500 pinks in Ketchikan Creek in September 1996, 490 pinks in Carlanna Creek in September 1979, 2,600 pinks in Hoadley Creek in September 1999, 5,000 pinks in Lewis Reef Creek in August 1983, and 3,000 pinks in Whipple Creek in August 1988 (ADF&G 2000b). [Note: these fish counts do not represent a “peak” count for the year they were surveyed, only the number observed on the day of the survey.]

Chum salmon spawn in many of the same places as pink salmon. In the vicinity of Ketchikan, chum salmon spawn from mid-June to mid-November in Government Creek, Ward Creek, Ketchikan Creek, Carlanna Creek, and Lewis Reef Creek. Chums feed on small insects in the streams and estuaries before joining schools in salt water where their diet usually consists of zooplankton. By autumn, they move out to the Gulf of Alaska and spend one to six winters there. In Southeastern Alaska, most chum salmon mature at four years of age, although considerable variation in age at maturity exists between streams (ADF&G 1999e). Snapshot counts completed by ADF&G represent the populations of chum salmon in the area. The agency recorded 400 chums in the Ward Creek in August 1998, 500 chum in Ketchikan Creek in September 1996, 6 chum in Carlanna Creek in September 1996 and 200 in Lewis Reef Creek in August 1983 (ADF&G 2000b). [Note: these fish counts do not represent a “peak” count for the year they were surveyed, only the number observed on the day of the survey.]

Coho salmon spawn and rear in most of the longer creeks in the Ketchikan area, and natural runs in Ketchikan and Ward Creeks are hatchery enhanced. Coho

Memorandum



enter and spawn in streams from mid-June through mid-November during periods of high runoff. The eggs develop during the winter, hatch in early spring, and the embryos remain in the gravel utilizing the egg yolk until they emerge in May or June. Coho spend one to three winters in project area streams before migrating to the sea as smolt. Time at sea varies. Some males (called jacks) mature and return after only six months at sea at a length of about 30 centimeters (12 inches), while most fish stay 18 months before returning as full size adults (ADF&G 1999e). Snap shot counts by ADF&G characterize the population of coho salmon in the project area: 1,000 chum were in Ketchikan Creek in December 1985 and 1,550 were in Ketchikan Creek in September 1983.

Adult Chinook salmon spawn and rear in Ketchikan Creek. Additionally, Deer Mountain Hatchery enhances the Chinook salmon run in the creek. Although total escapement has not been calculated, ADF&G recorded 1,433 Chinook in Ketchikan Creek in September 1983 (ADF&G 2000a). The fish return to Ketchikan Creek from mid-June through mid-August to spawn. Eggs hatch in late winter or early spring and juveniles remain in fresh water feeding on plankton and insects until the following spring when they migrate to the ocean. Chinook salmon spend one to seven years in the ocean eating a variety of organisms including herring, pilchard, sandlance, squid, and crustaceans.

ADF&G counted approximately 175 sockeye salmon in Ward Creek in October 1988. Sockeye do not spawn or rear in other creeks in the project area. Sockeye return to Ward Creek to spawn in July and August after spending one to four years in the ocean. After hatching, juveniles usually spend one to three years in Ward Lake before migrating to the ocean in the spring.

Steelhead trout (*Salmo gairdneri*) are rainbow trout that spend a part of their life in the sea. According to ADF&G Sport Fish Division snorkel counts, Ketchikan Creek has steelhead runs of 250 to 500. ADF&G estimate that Ward Creek has runs with approximately 200 steelhead (Hoffman 2000). Unlike salmon, steelhead spawn more than once, and fish over 71 centimeters (28 inches) are almost always repeat spawners. Peak adult steelhead migration into the area creeks occurs in November and December. Spawning commences in March and adults return the ocean in April and May. Generally, the juvenile steelhead will remain in the parent stream for about one to five years before outmigrating to salt water. Juvenile fish move to salt water in May to mid-July, depending on the watershed (Hoffman 2000).

Ketchikan Creek has an anadromous cutthroat trout population and Ward Creek has resident and anadromous cutthroat trout populations. Anadromous cutthroat come into the creek in the fall, overwinter, and sometimes stay through the spring. The juvenile fish hatch from the gravel in February. According to ADF&G, resident fish can reach 46 to 56 centimeters (18 to 22 inches) at there largest and

Memorandum



live to be 18 to 24 years old. The cutthroat fishery primarily is comprised of local fishers and is mainly catch and release (Hoffman 2000). Additionally, in anadromous stream mapping, ADF&G identifies Dolly Varden populations in Ward Creek. However, little information exists regarding the species.

Marine Fish

While southeastern Alaska rivers and streams have relatively few species of resident fish, marine waters contain hundreds of fish species. Flatfish, cod, rockfish, sculpin, skate, and sablefish are abundant in the marine waters throughout Southeast Alaska. Additionally, huge schools of herring, smelt, capelin, and Pacific sand lance collectively provide the food base for salmon, trout and char (O'Clair et al. 1997). This section gives detail of marine fish identified by ADF&G and the National Marine Fisheries Service (NMFS) as important in the Gravina Access Project area.

Pacific herring (*Clupea pallasii*) and their eggs are important food sources for a wide variety of fishes, mammals, and birds. Additionally, humans harvest herring eggs for consumption (commercial and subsistence). Near Ketchikan, herring spawn during the spring in eelgrass or *Fucus* beds at Totem Bight, Herring Bay, Mountain Point, and the north end of Gravina Island (Ketchikan Gateway Borough 1994; Heini 2000). The West Behm herring, ages three to seven years, spawn on or around Gravina Island from South Vallenar Point to Rosa Reef throughout the month of April (Walker 2000).

Herring eggs are adhesive, and survival is better for those eggs that stick to intertidal vegetation than for those that fall to the bottom. Following metamorphosis of the larvae to the juvenile form, they rear in sheltered bays and inlets and appear to remain segregated from adult populations until they are mature. After spawning, most adults leave inshore waters and move offshore to feed primarily on zooplankton such as copepods and other crustaceans (ADF&G 1999e); however, some herring concentrate near the mouth of Ward Cove in the winter (Ketchikan Gateway Borough 1994).

The state's limited entry program regulates substantial harvest for herring sac roe in Southeast Alaska (ADF&G 1999e). The closest commercial herring sac roe fishery to the project area is in Revillagigedo Channel. In a 7.5-hour herring sac roe fishing opening on April 1, 1998, 87 permitted operators caught 562 metric tons (620 tons) of herring (ADF&G 1999a). However, no openings occurred in 1999 because of low numbers (ADF&G 2000b).

Pacific halibut (*Hippoglossus stenolepis*) inhabit marine waters of the project area. Based on sport fishing catch information, most halibut in the Ketchikan area measure 64 to 104 centimeters (25 to 41 inches) and weigh between 6.8 and 11.3

Memorandum



kilograms (15 and 24 pounds) (ADF&G 1999b). Halibut eat a large variety of fishes, including cod, turbot, pollock, and some invertebrates such as crab and shrimp, and sometimes leave the ocean bottom to feed on pelagic fish, such as sand lance and herring. The fish spawn in the winter months. Free-floating eggs and larvae float for up to six months until they are carried to shallower waters by prevailing currents to begin life as bottom dwellers. Older fish often use both shallow and deep waters over the annual cycle; however, they have much smaller “home ranges” than halibut younger than 10 years (ADFG 1999e).

Other marine fish species that live in the marine waters of the Gravina Access Project area include yelloweye rockfish, shortracker, rougheye rockfish, dusky rockfish, walleye pollock, sablefish, lingcod, Pacific Ocean perch, arrowtooth flounder, Pacific cod, skates, and sculpin (Shaw 1999).

Amphibians

Most amphibians in Southeast Alaska occur on the mainland within major river valleys. However, it is assumed that the rough skinned newt and the western toad inhabit the project area, since these species have been observed on Annette Island and by U.S. Forest Service representatives on Gravina Island (Brown 2000; Reich 2000a).

The rough skin newt salamander (*Taricha granulosa*) is reported to range on the Pacific coast of North America from northern California to southern Southeast Alaska. The newts are common on Annette Island in creeks and wet areas (Wake 1998) and were observed in the Mahoney Lake Hydroelectric Project area on Revillagigedo Island by HDR Alaska, Inc. in 1995. Rough skinned newts have a mean total length of 11.9 centimeters (4.7 inches) and width of 1.3 centimeters (0.5 inches). The species is characterized by having dark blotching on its dorsal side.

The western or boreal toad (*Bufo boreas*) is common in southeastern Alaska and has been seen at night on roads in disturbed areas on Annette Island (Wake 1998). The toad is characterized by rough, warty skin with glands that secrete a fluid to discourage predation. Adult toads may reach a length of approximately 8.9 centimeters (3.5 inches). They breed in freshwater wetlands and move to terrestrial, non-forested areas to feed on insects and other small animals during adulthood (ADF&G 1999).

Birds

More than 300 bird species spend some period of time in Southeast Alaska, and 160 species nest in the near Ketchikan (O’Clair et al 1997). Around Revillagigedo and Gravina islands and the surrounding waters, local bird watchers and

Memorandum



naturalists have observed approximately 225 species of birds (Heinl and Goucher 2000). In the Gravina Access Project area, birds inhabit a variety of habitats including marine waters, freshwater wetlands, and forests at various times of the year.

Numerous species forage in the rocky intertidal habitat of Tongass Narrows. Waterfowl, including oldsquaw, bufflehead (*Bucephala islandica*), common goldeneye (*Bucephala clangula*), Barrow's goldeneye (*Bucephala islandica*), harlequin duck (*Histrionicus histrionicus*), white-winged scoter (*Melanitta fusca*), surf scoter (*Melanitta perspicillata*), common merganser (*Mergus merganser*), and red-breasted merganser (*Mergus serrator*), forage in the rocky intertidal zone of the Tongass Narrows during high tide (O'Clair and O'Clair 1998; Heinl 2000). They primarily feed on invertebrates and small fish in the ice-free waters along the coastline during the winter and breed in more northern areas of Alaska during the summer. Other species, primarily gulls, northwestern crows (*Corvus caurinus*), and common ravens (*Corvus corax*), feed on various invertebrates and opportunistically scavenge in the rocky intertidal areas during low tide. In the early spring, surf scoters and gulls, along with other species, gather and feed upon herring spawn on eelgrass and *Fucus*. Popular feeding areas include the Totem Bight area and the north end of Gravina Island. Gulls follow herring as they move northward along the coastline (Heinl 2000).

Some migratory waterfowl and summer seabirds concentrate just north of Pennock Island adjacent to downtown Ketchikan and at the head of Ward Cove (Ketchikan Gateway Borough 1994). Shorebird species, including western sandpipers (*Calidris mauri*) and red-necked phalarope (*Phalaropus fulicaria*), feed and stage in estuarine areas within the project area during the spring and fall migrations. However, larger estuaries outside the project area on Gravina Island provide more important habitat to birds migrating northward (Heinl 2000). Since most seabirds feed and nest near the open ocean, seabird colonies do not exist within the project area (Brockman 2000; Brown 2000; Heinl 2000; USFWS 2000).

Rock doves (*Columba livia*), chestnut-backed chickadees (*Parus rufescens*), winter wren (*Troglodytes troglodytes*), and varied thrush (*Ixoreus naevius*) breed and inhabit forested areas of the project area year round. Other passerines, including Swainson's thrush (*Catharus ustulatus*), orange-crowned warbler (*Vermivora celata*), and Townsend's warblers (*Dendroica townsendi*), breed in the area forests in the summer. American robin (*Turdus migratorius*), dark-eyed junco (*Junco hyemalis*), kinglet (*Regulus* spp.) Steller jay (*Cyanocitta stelleri*), and several warblers (family Emberizidae) use beach-fringe forests and scrub-shrub communities. Greater yellowlegs (*Tringa melanoleuca*) may nest in the freshwater fens (Nickles 1997).

Memorandum



The bald eagle (*Haliaeetus leucocephalus*) population in Southeast Alaska is stable (Ketchikan Gateway Borough 1994). The Audubon Christmas Bird Count identified 53 bald eagles in the Ketchikan area in December 1999 (National Audubon Society 2000).

Land Mammals

Approximately 50 species of terrestrial mammals inhabit the U.S. Forest Service's (USFS's) Tongass National Forest and most of Southeast Alaska (USFS 1997). Many of those species are found within the Gravina Access Project area. Ubiquitous species, including Sitka black-tailed deer, black bear, mink, beaver, and river otters, contend with heavy rains, deep winter snows, geographical barriers such as mountains, larger rivers, and wide marine channels that limit the distribution of terrestrial mammals in Southeast Alaska. They feed and breed in coastal rain forests, salt and freshwater wetlands, and alpine areas. While much information exists on larger land mammals, the exact distribution and numbers of many small mammals remains unknown.

GROUNDWATER

Groundwater in the study area is very shallow or at the ground surface. Most of the overburden is saturated. The overburden is comprised of unconsolidated marine deposits, beach and stream deposits including alluvial fan and fan-delta deposits, muskeg, and colluvium deposits. The marine deposits consist of poorly graded, fine-grained sand with some gravel and silt. Fan-delta deposits consist of sand, gravel, and boulders and become finer grained seaward. The deposits are present at the mouths of Ketchikan, Carlanna, and Hoadley creeks and other smaller streams that flow into the Tongass Narrows. The fan delta deposits also are associated with streams on Gravina Island that flow into the Tongass Narrows. The fan-delta deposits generally have a loose to medium density and are saturated. Low porosity in the glacial till and bedrock that are normally found beneath the soils in Ketchikan contribute to the poor drainage associated with soils on gentle slopes. All unpaved and undeveloped land areas serve as groundwater recharge areas for the surface aquifer.

There is no data available on groundwater quality in the study area. Because groundwater is unconfined and near or at the surface in the study area, groundwater quality could be directly affected by activities at the ground surface.

Memorandum



References:

Alaska Department of Environmental Conservation. 1998. Alaska's 1998 Final Section 303(d) List; 303(d) Water Quality-Limited Waterbodies. ADEC Division of Air and Water Quality.

Alaska Department of Fish and Game Division of Commercial Fishing. 2000a. Summary of the peak live counts of salmon for streams that drain into Tongass Narrows (District 101-47)

Alaska Department of Fish and Game Division of Commercial Fishing. 2000b. 1999 Alaska Herring Sac Roe Harvest. Updated March 17, 2000. <http://www.cf.adfg.state.ak.us/geninfo/finfish/herring/catchval/98catch.htm>

Alaska Department of Fish and Game Division of Commercial Fishing. 2000b. Summary of the peak live counts of salmon for streams that drain into Tongass Narrows (District 101-47)

Alaska Department of Fish and Game Division of Commercial Fishing. 1999a. 1998 Alaska Herring Sac Roe Harvest. Updated November 11, 1998. <http://www.cf.adfg.state.ak.us/geninfo/finfish/herring/catchval/99catch.htm>

Alaska Department of Fish and Game Division of Sport Fish. 1999b. Summary of Data from the Sport Fishery for Pacific Halibut in the IPHC Area 2C Portion of Southeast Alaska, 1999. Douglas, AK.

Alaska Department of Fish and Game Division of Wildlife Conservation. 1999. Wildlife Notebook Series: www.state.ak.us/local/akpages/FISH.GAME/notebook/notehome.htm.

Alaska Department of Fish and Game Division of Wildlife Conservation 1999e. Wildlife Notebook Series: www.state.ak.us/local/akpages/FISH.GAME/notebook/notehome.htm.

Brockman, Steve. Personal Communication on January 13, 2000. U.S. Fish and Wildlife Service. Ketchikan, Alaska.

Brown, Mike. Personal communication on February 16, 2000. US Forest Service. Ketchikan, Alaska.

Memorandum



Caroll, Florence. April 19, 2000. Telephone conversation between Caroll, US EPA NPDES Permitter, and Robin Reich, HDR Alaska, Inc., regarding seafood processor outfall permits in the Ketchikan Area.

Federal Emergency Management Agency. 1990. Flood Insurance Rate Maps for the City of Ketchikan, Ketchikan Gateway Borough. Community Panel Number 020003 0001 A and B.

Frietag, Gary. February 23, 2000. Telephone Conversation between Freitag, Marine Mammal Regional Stranding Coordinator, National Marine Fisheries Service, and Robin Reich, HDR Alaska, Inc. regarding marine mammals in the Ketchikan area.

Heinl, Steve and Teri Goucher. March 2000. Checklist of Birds of the Ketchikan Area, Alaska.

Heinl, Steve. 2000. Some Peak Seasonal Counts of Waterbirds on the Ketchikan Roadsystem. Ketchikan, Alaska.

Heinl, Steve. January 13, 2000. Personal Communication between Heinl, ADF&G Division of Commercial Fisheries and Robin Reich, HDR Alaska, Inc. regarding birds in the Ketchikan area.

Hoffman, Steve. April 3, 2000. Telephone conversation between Steve Hoffman, Alaska Department of Fish and Game Sport Fish Division, and Robin Reich, HDR Alaska, Inc., regarding sport fish in Tongass Narrows.

Ketchikan Gateway Borough Planning Department. 1994. Ketchikan District Coastal Management Program. Prepared by Susan A. Dickinson.

National Audubon Society. 2000. Species Counts for Ketchikan, Alaska (AKKE) for Counts 89-98. <http://birdsource.tc.cornell.edu/cbcddata/>.

National Oceanic and Atmospheric Administration (NOAA), July 1978. Tide information for Tongass Narrows, source unknown.

Nickles, Jon. May 22, 1997. Letter to Colonel Peter A. Topp regarding Tongass Narrows 504 2-9700001 from Jon Nickles, USFWS, Anchorage, Alaska.

O'Clair, R.M. R.H. Armstrong, R. Carstensen. 1997. The Nature of Southeast Alaska A Guide to Plants, Animals, and Habitats. Alaska Northwest Books. Seattle, WA.

Memorandum



O'Clair, R.M. and C.E. O'Clair. 1998. Southeast Alaska's Rock Shores Animals. Plant Press. Auke Bay, Alaska.

Reich, Robin. 2000a. Amphibians in the Gravina Access Project Area. Memo to File. HDR Alaska, Inc. Juneau, Alaska.

Rodgers, David. April 19, 2000. Telephone conversation between Rodgers, ADEC Division of Air and Water Quality and Robin Reich, HDR Alaska, Inc., regarding cruise ship wastewater discharge.

Shaw, Linda. 1999. Personal communication between Linda Shaw, NMFS Juneau, and Darcy Richards, HDR Alaska, regarding essential fish habitat.

Walker, Scott. April 4, 2000. Email from Scott Walker, Assistant Area Management Biologist, Alaska Department of Fish and Game Ketchikan, Alaska to Robin Reich, HDR, regarding herring.

U.S. Fish and Wildlife Service. 2000. The Beringian Seabird Colony Catalog Web Site. <http://164.159.151.5/seabird/index.html>

U.S Forest Service. 1997. Tongass Land Management Plan Revision: Final Environmental Impact Statement Part 1, Juneau, Alaska. January 1997.

U.S. Forest Service. 1979. Water Resources Atlas. United States Department of Agriculture, Region 10, Juneau, Alaska. April 1979.